LABORATORY CONTROL OF WATER SUPPLIES

By Dr. Edward Bartow

In Illinois the State Water Survey has been promoting the establishment of laboratories for the chemical and bacteriological control of the water supplies wherever such control is needed. During the last few years a number of water works in the state have established such laboratories. Sometimes it has been difficult to show the various water works operators, whether in the employ of companies or municipalities, the value of water analyses made either by themselves or by our laboratory.

The point of view that sometimes prevents the installation of laboratories may be illustrated by one of our experiences. An old gentleman over seventy years of age obtained from the laboratory the necessary bottles for the collection of water from his well. A few days later he brought back the bottles, stating, "My wife won't let me have the water analyzed for you might condemn it and then she could not drink it any more."

Many of the operators, however, are easily persuaded to install laboratories and those who have installed them have been delighted with the results.

It is not our purpose to discuss at length the control of large water supplies. The owners can employ their own experts and can establish the necessary laboratories for control. They will, of course, have a bacteriological laboratory that will contain all that is needed to make bacteriological investigation. They will have a sanitary-chemical laboratory containing the equipment necessary for sanitary-chemical analyses. They may even have a laboratory for the determination of the mineral content of the water; for such determinations are often necessary when waters of varying composition from a river or from a combination of several sources have to be treated. One suggestion with regard to such laboratories is: do not make the rooms too large. A compact arrangement increases efficiency.

In Illinois there are very few plants exceeding 5,000,000 gallons daily capacity. We recommend simple laboratories that are suit-

able for such small plants, where the operators hesitate to undertake extra work that will require extra help. We must also, necessarily, advocate only the simple and necessary tests. The simplicity of the outfit required is illustrated by one of the smallest laboratories (Fig. 1) in the state of Illinois, or even in the United States. This is a laboratory for the control of the iron removal plant of the Champaign and Urbana Water Company. The water treated is from deep

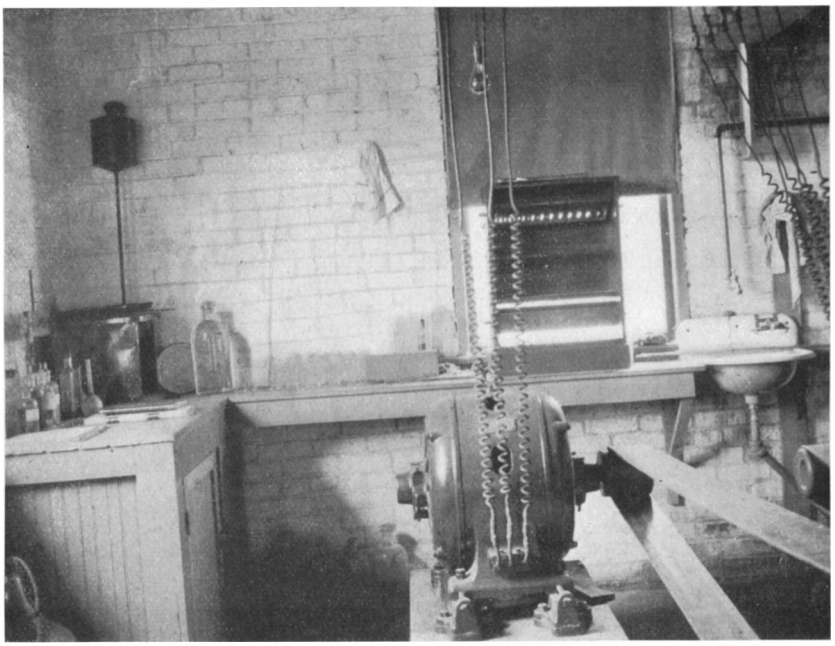

FIG. 1. LABORATORY IN IRON REMOVAL PLANT OF CHAMPAIGN AND URBANA WATER COMPANY.

wells and contains no bacteria. The chemical constituents are constant, therefore, the test for iron is the only one required. The necessary apparatus consists of a few collecting bottles, bottles for re-agents, a burette and some pipettes. These are installed on a simple laboratory table in one corner of the pump house.

For the control of filter plants using river water a more extensive outfit is needed. Tests for number of bacteria, gas forming bacteria, turbidity, color and alkalinity must be made. Several laboratories

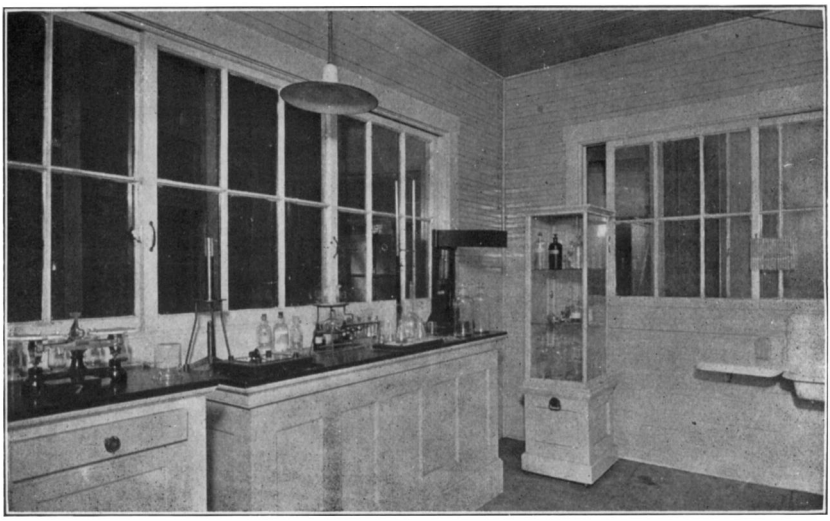

FIG. 2. LABORATORY OF CAIRO WATER COMPANY.

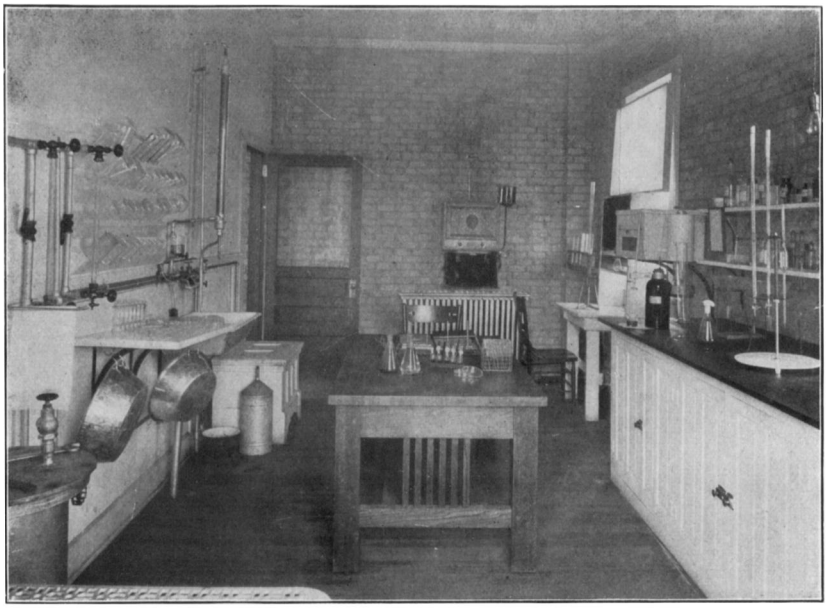

FIG. 3. LABORATORY OF DANVILLE WATER COMPANY.

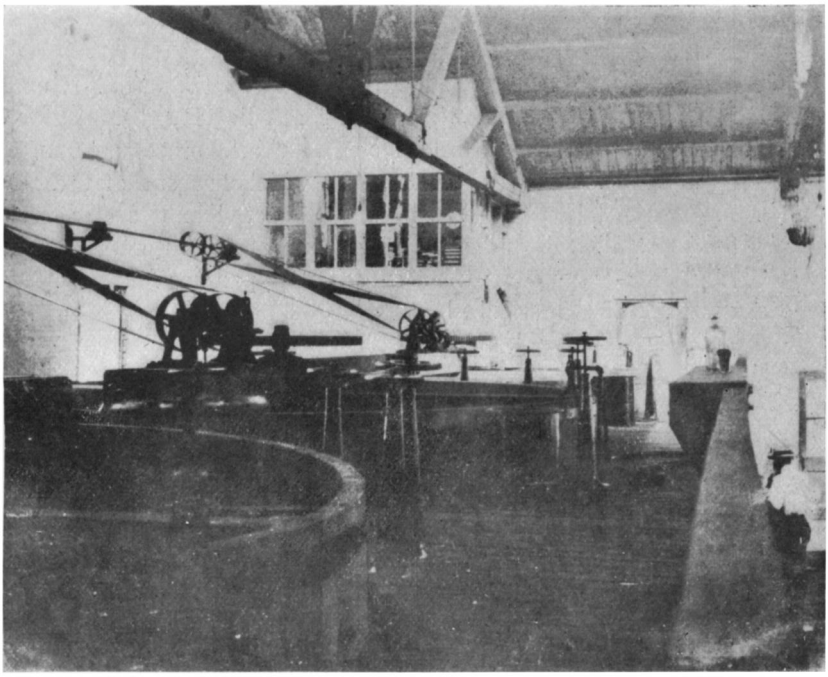

FIG. 4. LABORATORY BUILT IN FILTER HOUSE, PONTIAC.

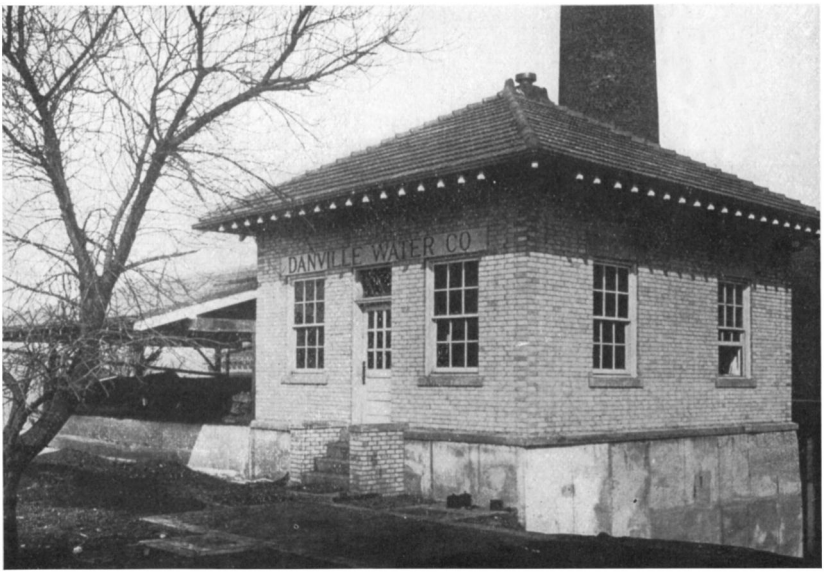

FIG. 5. OFFICE AND LABORATORY, DANVILLE WATER COMPANY.

of this type have been established and have given satisfaction. Good examples are at Cairo (Fig. 2), and at Danville (Fig. 3).

It often seems difficult to find space for the laboratory, but the difficulty can be overcome. At Pontiac, which has one of the old style plants, the laboratory has been constructed in one corner of the filter house (Fig. 4) and partly over one of the filters. It is 9 by 14 feet in size, and contains sufficient apparatus for the satisfactory control of this small plant.

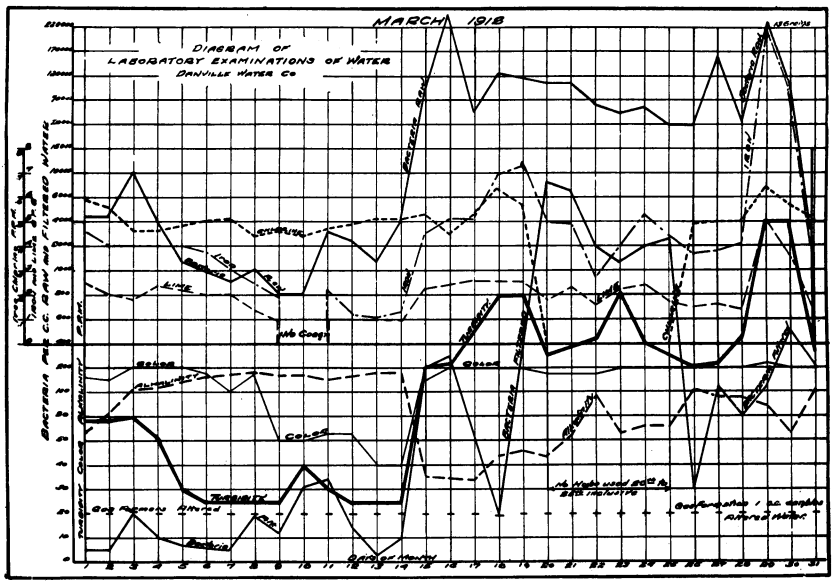

FIG. 6. DIAGRAM SHOWING CHEMICALS USED AND THE NUMBER OF BACTERIA FOUND MARCH 1913, DANVILLE, ILLINOIS.

More elaborate structures may be erected. The Danville Water Company recently constructed, adjacent to the plant, a building for an office and laboratory (Fig. 5) that adds considerably to the attractiveness of the plant. Charts are prepared each month by Mr. H. M. Ely of the Danville Water Company, to show the results obtained by this laboratory. The chart for March, 1913 (Fig. 6), has been reproduced in order to show some of the results which impressed upon the minds of the operators the necessity for complete and continuous control. The amount of bleaching powder is indicated by the available chlorine, which was discontinued on the

twentieth and was not used for the following six days. During this period the number of bacteria, as indicated, increased very largely, dropping as soon as the use of the bleaching powder was resumed.

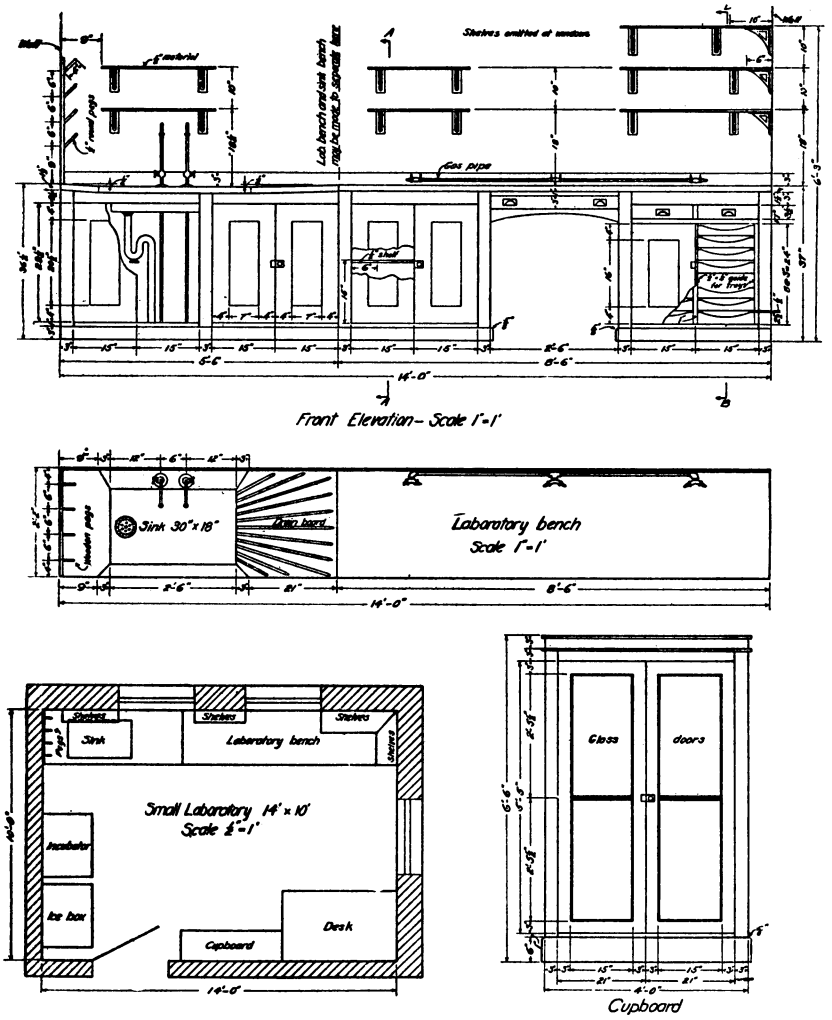

FIG. 7. PLAN OF SMALL LABORATORY AND DETAIL OF TABLE.

Positive tests for the gas formers were also evident during this period, and ceased immediately on the resumption of the use of the bleaching powder.

In order to assist operators in establishing laboratories, a list of the necessary apparatus and chemicals has been prepared.[1] The list is so arranged that an operator can choose what is needed for a small laboratory, or, for a more extensive laboratory.

A diagrammatic plan showing the fixtures needed in a small laboratory (Fig. 7) has been of value to those who have established laboratories. The table can be easily constructed, and the detailed plan has been used as the basis for several laboratory tables now in use in

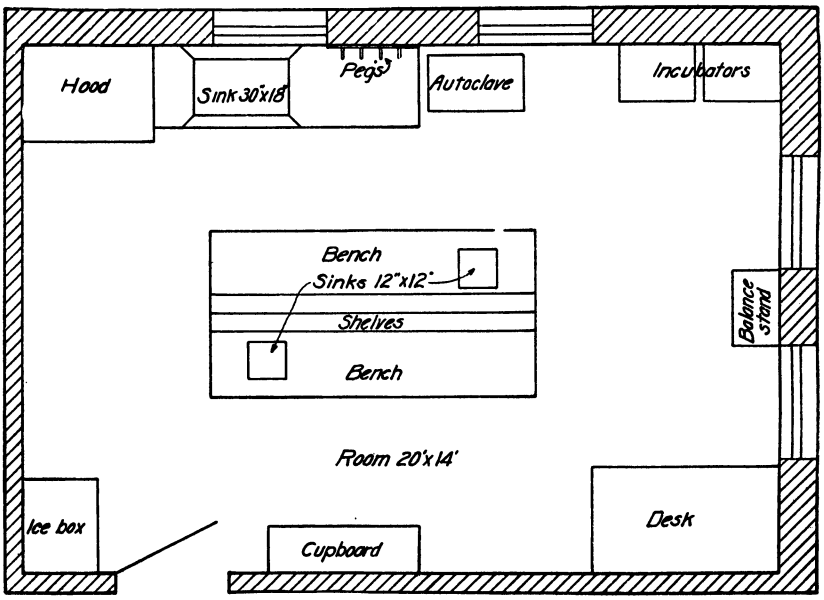

FIG. 8. PLAN SHOWING AN ARRANGEMENT OF FURNITURE IN SMALL WATER WORKS LABORATORY.

the state. If a larger outfit is desired, the table can be doubled (Fig. 8). For example, two units may be placed back to back in the center of the room, and the remainder of the furniture distributed around the sides of the room.

The suggestions which have been briefly described have been accepted by several of the water works operators, and we think we can safely say that those who have established laboratories and given them a thorough trial would be unwilling to dispense with them.

[1] *University of Illinois Bulletin*, Water Survey Series No. 8.